

Air Force

SBIR



ideas

to

innovations

Small Business Innovation  
Research Program

# Air Force SBIR Program



If you are part of a small business concerned with research and development, this brochure could prove very valuable.

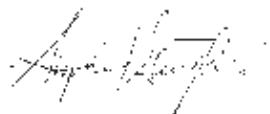
The Air Force created this brochure to encourage more small businesses to participate in the Small Business Innovation Research (SBIR) Program, which was designed specifically to increase the number of contracts awarded to small businesses for federal research and development. It also serves to introduce the Small Business Technology Transfer (STTR) Program which encourages partnerships between small businesses and universities or research institutions for technology development.

Recent changes in the U.S. defense structure have added increased focus on the critical nature of Department of Defense (DoD) Research and Development (R&D) efforts, and the importance of small business in meeting future technology needs has received increased emphasis. This more-focused emphasis has resulted in greatly expanded funding in support of the SBIR Program. Congress' full recognition of the past success of the SBIR Program has resulted in an increased SBIR budget and the addition of the STTR Program which is modeled after SBIR.

The SBIR Program offers a great opportunity for small companies to obtain important funding for high risk R&D. The STTR Program provides opportunity and funding to teams of small firms and academic institutions engaged in the pursuit of technology development. Both programs have been used successfully to facilitate entry into government contracting while allowing the retention of data rights necessary for future commercialization.

Please take a few moments to read through this brochure. It could mean a new future for your small business. If we can answer any questions about the Air Force's SBIR or STTR Program, please contact the Air Force SBIR Program Management Team at (800) 222-0336.

Sincerely,



Stephen Guilfoos

Air Force SBIR/STTR Program Manager



# The Air Force Re



The mission of AFRL is to lead the discovery, development, and integration of affordable warfighting technologies for our aerospace forces. It's emphasis is on results. AFRL is organized along technology disciplines into nine technology directorates plus the Air Force Office of Scientific Research.

Each technology directorate performs, procures, and synthesizes basic research, exploratory technology development and advanced technology development within its areas of responsibility, with a clear mandate to provide integrated solutions to customer requirements. The Air Force SBIR Program is part of the AFRL and serves the AFRL mission.

To learn more about the technology focus of each of the directorates, go to page 15.

## Technology Directorates

### Space Vehicles Directorate

Develops technologies to support evolving warfighter requirements to control and exploit space. Focus areas include the battlespace environment, protection of space assets, space vehicle control, space-based sensing, space vehicle technologies, wargaming, and broad spectrum integrated demonstrations.

### Air Vehicles Directorate

Develops and transitions superior technology solutions that enable dominant military aerospace vehicles. Core technology areas include aeronautical sciences, control sciences, structures, and integration. The directorate employs an integrated concept approach for the development of vehicle technologies to provide future capabilities in the areas of sustainment, uninhabited air vehicles, and trans-atmospheric and space vehicles.

### Information Directorate

Develops information technologies for aerospace command and control and its transition to air, space, and ground systems for global awareness, dynamic planning and execution, and global information exchange. Technology focus areas encompass a broad spectrum of information and fusion, communication, collaborative environments, modeling and simulation, defensive information warfare, and intelligent information systems technologies.

### Munitions Directorate

Develops munitions technologies to defeat fixed, mobile/relocatable, air and space targets. Technology exploration concentrates on warheads, fuses, explosives, seekers, image and signal processing, navigation and control, assessments, and subsystem integration.

# search Laboratory

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## **Directed Energy Directorate**

Develops directed energy technologies to precisely project force anywhere, at any time, with graduated intensity, at the speed of light. Focus areas include moderate and high-power microwaves, and advanced optics and imaging technologies.

## **Materials and Manufacturing Directorate**

Develops materials, processes and manufacturing technologies for use in aircraft, spacecraft, missiles, rockets, and ground-based systems and their structural, electronic and optical components. Areas of expertise include thermal protection materials, metallic and nonmetallic structural materials, nondestructive inspection, materials used in aerospace propulsion systems, electromagnetic and electronic materials, laser hardened materials, and systems support for quick reaction problem solving for the Air Force's using commands and logistics centers. The directorate is also responsible for Air Force technology programs that address environmental issues.

## **Sensors Directorate**

Develops advanced sensors for both air and space reconnaissance, surveillance, precision engagement and electronic warfare applications. Key focus areas involve radar, active and passive electro-optical systems, electronic support measures and countermeasures, navigation aids and automatic target recognition.

## **Propulsion Directorate**

Develops propulsion technologies for air and space vehicles, including turbine and rocket engines, advanced propulsion systems, and the fuels and propellants they run on. The directorate is also responsible for most forms of power technology.

## **Human Effectiveness Directorate**

Develops technologies to prepare, protect, and sustain personnel and enhance human interactions with weapons, systems, and tools.

## **Air Force Office of Scientific Research**

Manages the Air Force's entire basic research investment. Its technical experts sponsor and direct basic research conducted in the nation's academic institutions, U.S. industry, and other government agencies. Using a carefully balanced research portfolio, its research managers create new technology and advance current knowledge, then quickly transition research accomplishments for further development. It maintains scientific liaison offices in Europe and Asia.

# An SBIR Overview

The Small Business Innovation Research (SBIR) Program was created in 1982 with the enactment of the Small Business Innovation Development Act. SBIR was designed to stimulate technological innovation among small private-sector businesses while providing the government new, cost-effective, technical and scientific solutions to challenging problems. At the same time, SBIR encourages small businesses to market the SBIR technology in the private sector which, in turn, helps stimulate the U.S. economy.

Small business has played an ongoing, highly successful role in developing critical technology innovations for the Department of Defense (DoD). The DoD SBIR

Program funds over \$500 million each year in early-stage R&D projects at technology companies with 500 or fewer employees.

The United States Air Force has benefited from this ongoing R&D "partnering" relationship with small business in meeting challenges across the spectrum of aerospace technology requirements.

Over the years the SBIR Program has compiled an enviable record of win-win successes for both the government and small businesses located around the country. Under the SBIR Program, qualified small businesses are provided a competitive opportunity to propose innovative concepts for meeting the R&D needs of the federal

government. The results of the SBIR Program have been important to national defense and to the work of other federal agencies.

## A Competitive Opportunity

Research and development are major factors in the growth and progress of industry. However, the expense of carrying on a serious R&D program is beyond the means of many small business concerns. This places such businesses at an immediate competitive disadvantage.

The SBIR Program helps even-up the playing field. At the front end of the process the small R&D business is offered the opportunity to compete for contracts for federal research. The government's front-end funding of the high risk research allows the best ideas to surface. Successful SBIR efforts may result in the opportunity for small businesses to commercialize the results of the SBIR project, while serving to lower the risk for most private investors interested in commercializing the technology. Hundreds of small businesses nationwide have already obtained public and private sector contracts as a follow on to SBIR. Many of these are Air Force contracts.





## The Program

Ten federal agencies with extramural (outside) R&D budgets exceeding \$100 million are required to participate in the SBIR Program. Each agency allocates 2.5% of its annual extramural R&D funds towards the program. These agencies include:

- Department of Defense
- Department of Agriculture
- Department of Health and Human Services
- Department of Transportation
- National Aeronautics and Space Administration
- Department of Commerce
- Department of Energy
- Environmental Protection Agency
- National Science Foundation
- Department of Education

Each year these agencies identify various R&D topics for pursuit by small businesses under the SBIR Program. The topics represent scientific and technical problems requiring innovative solutions. These topics are bundled together into agency solicitations which are distributed to interested small businesses. (See information on page 8 on how to be added to the SBIR mailing list.)

After reviewing the solicitation material, a small business can identify an appropriate topic it wants to pursue and offer a proposal. The format for submitting a proposal is slightly different for each agency. However, all the necessary information is found in each agency's solicitation.

The proposals are reviewed and evaluated on a competitive basis by technical experts in the federal laboratories or research centers. Each agency then selects the best proposals, awarding contracts to the most highly qualified small businesses with the most innovative solutions.

Since the program's inception, over 26,000 DoD SBIR awards have been made totaling over \$5.3 billion. (Source: DoD SBIR database.)

The Small Business Administration (SBA), which oversees the administration of SBIR, estimates that over 40% of SBIR activities result in commercially marketed technology products from the participating small businesses.

## SBIR Objectives

The SBIR Program was designed and developed as a "pro small business" engine for change and innovation.

According to Public Law, SBIR has four principal objectives:

1. To stimulate technological innovation by small business.
2. To increase small business participation in meeting federal research and development needs.
3. To increase the commercialization of technology developed through federal research and development.
4. To enhance outreach efforts to ensure that all qualified small businesses are aware of this opportunity and the many benefits of participating in the SBIR Program. Outreach efforts should particularly be directed to socially and economically disadvantaged small business concerns and women-owned small businesses.



# Three Phase Process

## Phase I

Phase I contracts determine the feasibility of a new technology and are valued up to \$100,000. They are awarded for research efforts lasting from six to nine months, depending on the agency. The Air Force offers a nine-month contract. Each agency issues a solicitation at least once a year requesting Phase I proposals for a variety of topics. Proposals are limited to 25 pages and must comply with explicit, easy-to-follow instructions explained in the solicitation.

Phase I winners are chosen competitively by an agency's technical and scientific experts.

## Phase II

Phase II contracts are only awarded to successful Phase I contract winners. Awards for Phase II contracts are based on Phase I results and the scientific and technical merit of the Phase II proposal.

Besides the scientific quality of the Phase II proposal, the potential of the concept for commercial applications is given careful consideration. These awards are typically for two years to accomplish the primary research effort and are valued up to \$750,000.

## Phase III

Phase III involves private sector or federal agency funding (outside the SBIR Program) to commercialize a Phase II project.

While small business is ultimately responsible for the commercial marketing and sale of the technology or product developed under SBIR, the government encourages commercialization efforts. In this role, the government makes every reasonable effort to ensure that any government follow-up action to research, develop or produce technology created under SBIR is accomplished through contracts with the same SBIR small business that originally developed the technology.



# Qualifying

## Small Business

To participate in the SBIR Program a company must first qualify as a small business. As defined by the federal government, a small business is one that:

- is independently owned and operated;
- is organized for profit;
- has its principal place of business located in the United States;
- is at least 51% owned by U.S. citizens; and
- has no more than 500 employees.

## Award Eligibility

For a small business to be eligible for an SBIR award, the following criteria must be met:

- the principal investigator involved in the research must be primarily employed by the proposing firm;
- two-thirds of Phase I and one-half of Phase II work must be accomplished by the proposing firm. (Joint ventures and limited partnerships are permitted); and
- all work must be performed within the United States.



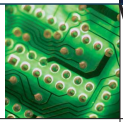
## SBIR Impact Story

**Laser Imaging Systems, Inc.  
Punta Gorda, Florida**

Laser Imaging Systems, Inc. used SBIR contracts to advance the development of their patented GasVue technology into a sensitive portable gaseous leak location system capable of meeting Air Force requirements. The company has received requests for three other "spin-off" devices for industrial applications. The company is also in discussions with both the Environmental Protection Agency and Ford Motor Company on possible applications of the technology.

To discover more about the impact of SBIR on this company and others visit the Air Force SBIR website at: [www.afrl.af.mil/sbir/index.htm](http://www.afrl.af.mil/sbir/index.htm)





# Winning Contracts

## Evaluation Criteria

SBIR contracts are awarded competitively based on standardized evaluation criteria. These criteria include:

- a. The soundness, technical merit, and innovation of the proposed approach and its incremental progress toward topic or sub-topic solution.
- b. The qualifications of the proposed principal/key investigators, supporting staff, and consultants. Qualifications include not only the ability to perform the research and development but also the ability to commercialize the results.
- c. The potential for commercial (government and/or private sector) application and the benefits expected to accrue from this commercialization.

All proposals are evaluated by scientists and engineers who are well versed in the topic area being considered. The majority of topics are very specific in their technology requirements. However, many are created as "generic" topics searching for innovative solutions to broad requirements. Examples: "Develop innovative human-related systems or subsystems for aerospace applications;" or "Develop innovative information technologies for enhancing the performance and affordability of C4I systems."

## Get on the SBIR Mailing List

The Small Business Administration (SBA) maintains a computerized SBIR Pre-Solicitation Announcement. This announcement is updated quarterly and contains important information on the SBIR Program and details on SBIR solicitations that are about to be released.

Contact the SBA's SBIR Office:

Office of Technology  
U.S. Small Business Administration  
409 3rd Street, SW, 8th Floor  
Washington, DC 20416  
T: (202) 205-6450

For access to SBA's Bulletin Board:  
[www.sbaonline.sba.gov](http://www.sbaonline.sba.gov)

To be added to the mailing list for DoD solicitations, contact:

DTIC-SBIR  
Building 5  
Cameron Station  
Alexandria, VA 22304  
T: (800) 363-7247  
e-mail: [sbir@dtic.mil](mailto:sbir@dtic.mil)

To access DTIC electronically, use the following on-line address:  
[www.dtic.mil/dtic/sbir/tis.html](http://www.dtic.mil/dtic/sbir/tis.html)

## SBIR Impact Story

**Maxdem Inc.**  
**San Dimas, California**



Maxdem Incorporated won SBIR contracts to develop new high performance foam core materials based on a new family of polymers invented at Maxdem offering a superior combination of low specific gravity, exceptional rigidity, high strength and low moisture absorption rates. The company is now collaborating with

Northrop Grumman Corp. and a commercial foam producer. Aircraft and helicopter manufacturers have shown considerable interest in the new foam core.

To discover more about the impact of SBIR on this company and others visit the Air Force SBIR website at: [www.afrl.af.mil/sbir/index.htm](http://www.afrl.af.mil/sbir/index.htm)

## Seek Special Defense Department Assistance

Recognizing that small businesses may not have strong technical information service support, the Department of Defense provides special assistance to small businesses participating in the SBIR Program.

The Defense Technical Information Center (DTIC) is the central source for scientific and technical information concerning research and development projects funded by DoD agencies like the Air Force.

DTIC features an interactive electronic forum called SBIR Interactive Topic Information System (SITIS). SITIS allows small businesses to ask technical questions about solicitation topics.

Many successful SBIR Phase I and Phase II award winners believe DTIC provided them the necessary information in making correct bid/no bid decisions and in preparing technically stronger proposals.

Additional information on DTIC can be found in the DoD Solicitation and in the resources section of this brochure.

## SITIS

SITIS is an electronic forum through which small businesses may ask technical questions about the solicitation topics. All questions and answers will be accessible to anyone using the system.

SITIS should not be used to ask general questions about the SBIR Program or solicitation, which instead should be directed to (800) 382-4634.

SITIS is accessible through the Web at: <http://dticam.dtic.mil/sbir/index.html>

Technical questions about solicitation topics can also be submitted via e-mail, fax, paper mail, or telephone by contacting the SBIR Coordinator at:

Defense Technical Information Center  
MATRIS Office, DTIC-AM  
ATTN: SBIR Coordinator  
53355 Cole Road  
San Diego, CA 92152-7213  
T: (619) 553-7000  
F: (619) 553-7053  
e-mail: [sbir@dticam.dtic.dla.mil](mailto:sbir@dticam.dtic.dla.mil)



SITIS electronically posts all questions and answers by topic number, for general viewing, throughout the pre-solicitation and solicitation period. Answers are generally posted within seven working days of submission of a question. (Answers will also be e-mailed or faxed directly to the inquirer if the inquirer provides an e-mail address or fax number.) Questions will be accepted until 30 days before the solicitation closing date.

According to both Air Force Laboratory scientists/engineers and successful SBIR awardees, marketing research is important. These early marketing discussions have often proven invaluable in preparing future SBIR proposals, and small businesses have also learned of other types of solicitations (e.g., broad agency announcements) against which they can propose.

# Winning Tips



## Marketing to Air Force R&D Interests

As in any business enterprise, an essential element in "making the sale" involves early marketing research and networking. Market research and networking, i.e., getting to know the customer and their R&D requirements, is an important early step taken by a majority of successful Phase I SBIR awardees.

The following paragraphs explain the most commonly used marketing methods and tools.

### Networking

Within the Air Force there are a large number of organizations that submit solicitation topics to the SBIR Program. Small businesses should initially determine the specific Air Force organization working with the business' basic line of research. A previous DoD solicitation with Air Force topics can be used as a handy reference for this purpose. Find the topics that are of interest, match them to the location listed, and call the SBIR manager shown for that location. This Manager should be able to direct you to the key players in your area of research. Discussions with the key scientists and technicians can be a valuable marketing tool. It allows the business to

determine the laboratory's current research interests and its future needs while providing an excellent opportunity to discuss the business' research ideas.

### Pre-Solicitation Release

A new Pre-Solicitation Release (PSR) is now being used by the Air Force and DoD. It contains full descriptions of the topics expected to appear in the final solicitation, and it lists the name and number of the technical point of contact (TPOC) most likely to author, for each topic. The PSR gives the small business time to ask technical questions of the TPOC before the formal solicitation is issued.

After formal solicitation, no technical discussion with the TPOC is allowed. The Air Force PSR is accessible on the Air Force SBIR homepage in July of each year.

Once the solicitation is released and contracts awarded, all formal communication shall be through the Air Force Contracting Officer assigned to the specific SBIR topic.

The DoD PSR is available in September, which still leaves two months for open discussion concerning technology issues. After the solicitation itself is issued in December, the only allowable technical questions are those that appear in SITIS (see page 9).

## Tips for Writing Proposals

### Appearance

Make sure that the proposal is well written, clear to the reader, well organized, legible and neat.

### Length

The proposal must not exceed 25 pages, excluding agency-required addendum items.

### Timeliness

Ensure that the proposal is delivered by the date and time specified.

### Novelty

Ensure that the proposed concept is new and innovative.

### Realism

Propose a realistic program and work schedule.

### Expertise

Demonstrate convincingly that the company has or will have access to the technical and business skills and resources needed to complete the activity.



# Air Force SBIR Program Flies High

The U.S. Air Force participates in the federal SBIR Program as part of the \$500 million Department of Defense (DoD) Program. In terms of budget and contract awards, the Air Force SBIR Program is the largest within the DoD. It is now over \$200 million per year, and is expected to remain at that level over the next few years. Air Force SBIR topics come from an extensive national resource of Air Force laboratory sites, product centers, program offices, test centers and logistics centers located around the United States.

The SBIR Program has grown to become an integral part of the Air Force research and development success story. The Air Force SBIR Program has yielded a stream of innovative technology solutions in the fields of lasers, optics, avionics, materials, engines, protective clothing, flight dynamics, and environmental quality to name just a few.

It is because of the program's success that Congress doubled the set-aside for SBIR. In 1992, 1.25% of the R&D budget was used for SBIR, but when the program was reauthorized, this percentage was gradually increased to 2.5% in FY 1997.

The Air Force topics appear in the DoD solicitation which is released December 1 each year. For FY 1999, the DoD solicitation contains close to 280 SBIR topics. See the previous page for an explanation of Air Force Pre-Solicitation Releases that makes information on the topics available before the normal December solicitation.

Nearly 31,300 SBIR proposals were received by the Air Force between 1992 and 2000. From these proposals 4,495 Phase I and 2,298 Phase II contracts were awarded. In 2000 the Air Force made over 350 Phase I, and more than 150 Phase II awards. (Source: Air Force SBIR database.)

Below is a sampling from a recent Air Force SBIR solicitation.

- Space-Based Ultra-Wideband Antennas
- Affordable Laser System for Launch Vehicle and Satellite Tracking
- Modular, Protective Container for Payload Transportation
- Optimal Design of Active Noise Control Systems
- High-Resolution Visual System Development
- Network Common Data Link (CDL)
- Innovative Information Technologies
- Non-Destructive Recognition/Prediction of Structural Corrosion Damage
- Target Detection and Orientation with Advanced Short Pulsed Optical Components
- High Power Microwave Source Cooling to Enable Compact Directed Energy Weapons
- Micropropulsion Thruster for Low Power Satellites
- Ultra Wide Band High Performance RF Links



# STTR Overview

The STTR Program was authorized by Congress as a pilot program in 1992 to fund cooperative R&D projects. It joins two powerful forces for technological progress: the entrepreneurial talent of the high-tech small business and the science and engineering expertise of the nation's universities and research institutes. After a successful start, STTR was established as a permanent program in 1997.

Although modeled substantially on the SBIR Program, STTR is a separately funded program of the federal government. The goals of STTR are to spur economic growth and strengthen industrial competitiveness. The Air Force budget for STTR is approximately \$10 million and is expected to remain at this level over the next few years.

Under STTR, contracts are competitively awarded to small businesses for research and development projects conducted in cooperation with research institutions. While the primary goal of this cooperative effort is to develop innovative solutions to challenging DoD scientific and engineering problems, those proposals having the greatest potential for commercialization are of particular interest and are given priority.

STTR was established to provide a strong incentive for small businesses and technical experts at research institutions to join forces and tap into the storehouse of research being done at universities and independent research institutions. It was felt that this powerful combination of entrepreneurial drive and technical talent could team up to move ideas from the laboratory to the marketplace.

## Competitive Three Phase Program

Phase I: One year award of up to \$100,000 to determine the scientific, technical and commercial feasibility of the proposed cooperative effort.

Phase II: Up to \$500,000 awarded for a 24-month period to further develop the concept of a Phase I effort.

Contract award selections are based on results from Phase I work, the scientific and technical merit of the proposal, and the commercial potential of the proposal.

Phase III: As in the SBIR Program, the small business is expected to pursue private-sector or federal-agency funding (outside the STTR Program) to commercialize Phase II STTR projects.

## SBIR Impact Story



### Geneva Aerospace, Inc. Dallas, Texas

Geneva Aerospace, a six person small business, won Air Force SBIR contracts to develop a system that greatly simplifies the control of Unmanned Aerial Vehicles (UAVs) for remote operators. With this new UAV control technology, unskilled operators with no piloting or aviation experience can fully control an

unmanned aerial vehicle. The company has begun commercializing its product and believes the technology can be the catalyst that drives the use of UAVs for applications in areas such as border patrol monitoring, farming, search and rescue, pipe line and power line inspection and motion picture filming.

To discover more about the impact of SBIR on this company and others visit the Air Force SBIR website at: [www.afrl.af.mil/sbir/index.htm](http://www.afrl.af.mil/sbir/index.htm)

# Qualifying for STTR

## Award Eligibility

- a minimum of 40% of the STTR project must be carried out by the small business (see page 7 for small business qualifications);
- a minimum of 30% of the effort must be performed by the research institution;
- a written agreement must be negotiated with the research institution; and
- Phase I and Phase II research work must be performed by the small business and the research institution in the United States.

Note: Joint ventures and limited partnerships are permitted to participate, provided the entity created qualifies as a small business.

## Research Institution

- a nonprofit university or college;
- a nonprofit institution owned and operated exclusively for scientific or educational purposes; and
- in a contractor-operated, federally funded, R&D center (FFRDC).

Note: Not all FFRDCs are qualified to participate. The only DoD FFRDCs that are qualified are Lincoln Laboratory and Carnegie Mellon. Any FFRDC must have approval from their sponsor to be able to participate. The principal investigator may be at the research institute.

## SBIR Impact Story

### Nomadics, Inc. Stillwater, Oklahoma

Nomadics, Inc. received a SBIR contract to apply their patented sensor technology, based on the PC card architecture, toward the development of instruments to meet environmental monitoring requirements. Nomadics technology allows development of laboratory quality instruments in a credit card-sized device that plugs into a portable computer

Nomadics has already licensed the technology to other companies that now market the product overseas.

To discover more about the impact of SBIR on this company and others visit the Air Force SBIR website at: [www.afrl.af.mil/sbir/index.htm](http://www.afrl.af.mil/sbir/index.htm)



# Air Force Research Laboratory (AFRL) Technology



The following information offers a brief overview of the research and technology development ongoing at the Air Force Research Laboratory and related Air Force technology centers around the country.

It is intended to give you an idea of the breadth of research and development performed by the Air Force. Furthermore, these technologies may be in any stage of activity, ranging from basic research to engineering development.

This information will help you narrow your search for the correct Air Force point of contact in your particular field of scientific research or engineering. The information specifies which technology areas are being pursued at each of the Air Force Research Laboratory's ten directorates as well as the technology focus of Air Logistic Centers and Test Centers throughout the Air Force. It also lists the name of each organization's SBIR representative along with a telephone number for your convenience.





**Air Force Office of Scientific Research (AFOSR)**  
Arlington, VA  
[www.afosr.af.mil](http://www.afosr.af.mil)

AFOSR directs the Air Force's basic research program. This includes research in Physics, Electronics, Materials, Chemistry, Math and Computers, as well as Biological Environmental Sciences and all engineering disciplines associated with aerospace issues.

**Aerospace and Material Sciences**

- Structural mechanics
- Mechanics of materials
- Fluid mechanics
- Propulsion diagnostics
- External aerodynamics and hypersonics
- Turbulence and internal flows
- Airbreathing combustion
- Space power and propulsion
- Propulsion diagnostics
- Metallic structures materials
- Ceramics and non-metallic structural materials
- Organic matrix composites

**Chemistry and Life Sciences**

- Chemical reactivity and synthesis
- Polymer chemistry
- Surface sciences
- Theoretical chemistry
- Molecular dynamics
- Chronobiology and neural adaptation
- Cognition
- Sensory systems
- Bioenvironmental sciences

**Physics and Electronics**

- Electronic device components and circuits
- Optoelectronic information processing devices and systems
- Quantum electronic solids
- Semiconductor and electromagnetic materials
- Photonic physics
- Optics
- Atomic and molecular physics
- Plasma physics

**Mathematical and Geosciences**

- Dynamics and control
- Physical mathematics and applied analysis
- Computational mathematics
- Optimization and discrete mathematics
- Signal processing, probability and statistics
- Software and systems
- Artificial intelligence
- Electromagnetics
- Terrestrial sciences
- Meteorology
- Ionospheric research
- Space sciences



**Air Vehicles Directorate AFRL/VA**  
Wright-Patterson AFB, OH  
<http://www.va.afrl.af.mil/>

**Propulsion Directorate**  
Wright-Patterson AFB, OH  
[www.pr.afrl.af.mil](http://www.pr.afrl.af.mil/)

**Sensors Directorate**  
Wright-Patterson AFB, OH  
[www.sn.afrl.af.mil](http://www.sn.afrl.af.mil/)

The Air Vehicles Directorate mission is to develop and transition superior technology solutions that enable dominant military aerospace vehicles.

#### **Aeronautical Sciences**

- Advanced Configurations
- High Speed Aero
- Computational Fluid Dynamics (CFD)/ Computational Electromagnetics (CEM) Research
- Applied CFD/CEM Methods
- Airframe/propulsion/weapon integration
- Aerospace Vehicle Demonstration

#### **Control Sciences**

- Flight Management Systems
- Flight Vehicle Simulation
- Flight Vehicle Prognostics and Health Monitoring
- Intelligent Autonomous Flight Vehicle Control
- Simulation Based Research and Development
- Biomimetic Control Applications
- Cooperative and Distributed Control of Unmanned Flight Vehicles
- Flight Vehicle Control Actuation/Effectors
- Photonic Based Vehicle Management and Control Systems

#### **Aerospace Structures**

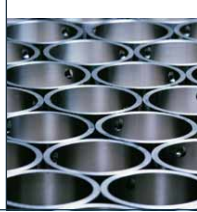
- Aging aircraft
- Integrated design techniques
- Integrated Vehicle Health Management (IVHM)
- Extreme environment structures
- Smart structures
- Low cost structures

The Propulsion Directorate's mission is to create and transition propulsion and power technology for the military dominance of air and space.

- Airbreathing engines (turbojets, turbofans, ramjets, and scramjets) for aircraft, weapons, and UAVs
- Rocket propulsion (solid and liquid fueled) for air-launched and ballistic missiles, space launch vehicles, upper stages, and satellites
- Combined cycle engines (such as rocket based combined cycles) for efficient flight over a broad range of speeds and altitudes
- Non-traditional propulsion (Electric, solar, pulse detonation, and laser) to enable a paradigm shift in propulsive capabilities
- Aircraft and missile power (electrical and mechanical power generation, conditioning, and distribution; energy storage; and thermal management) for aircraft, UAVs, satellites, and directed energy weapons
- Advanced fuels, propellants, and engine lubricants
- Plasma physics and combustion science
- Modeling and Simulation

The Sensors Directorate is responsible for developing technologies to collect, measure, and interpret important military information worldwide and deny the enemy the same.

- Reconnaissance – surveillance
- Radio frequency sensors and countermeasures technology
- Radar
- Electronic warfare
- Antennas/apertures
- Adaptive processing
- Digital receivers and exciters
- Electro-optical/Infrared sensors and countermeasures technology
- Target detection and identification
- Electro-optic/infrared threat warning and countermeasures
- Multi-discriminant sensing
- Multi-function sensing
- Automatic target recognition
- Sensor fusion
- Target modeling
- GPS anti-jam technology
- Microelectronics
- Microwave and components
- Electro-optic detectors
- Integrated focal plane arrays



**Materials and Manufacturing Directorate**  
**Wright-Patterson AFB, OH**  
[www.ml.afrl.af.mil](http://www.ml.afrl.af.mil)

The Materials and Manufacturing Directorate mission is to plan and execute the USAF program for materials and manufacturing processes in the areas of basic research, exploratory development and advanced development. The directorate provides support to solve system related problems and to transfer expertise in the areas of materials and manufacturing processes.

- Thermal protection materials
- Ceramic, metallic, and nonmetallic structural materials
- Aerospace propulsion materials
- Electronic and optical materials
- Laser-hardened materials
- Nondestructive testing
- Lightweight, superstrength structural materials and compounds
- Nonstructural materials including paints and coatings, elastomers, sealants, fluids and lubricants
- Spacecraft materials including thermal control materials and lightweight structural materials
- Manufacturing and engineering systems
- Metals/non-metals/electronics processing and fabrication
- Advanced industrial practices
- Materials process design
- Affordability
- Lean manufacturing
- Analytical services — supports environmental pollution control programs
- Bioenvironmental engineering — hazard abatement and pollution control radiation exposure histories for all AF personnel, noise and sonic boom effects
- Occupational medicine — occupational and environmental hazards
- Directed energy research — effects of electromagnetic and particulate radiation
- Toxicology research — hazards of chemicals and materials
- Environics — prevention of environmental problems and site restoration
- Air base systems



**Munitions Directorate**  
**Eglin AFB, FL**  
[www.mn.af.mil](http://www.mn.af.mil)

The Munitions Directorate's mission is to develop, integrate, and transition science and technology for air-launched munitions for defeating ground fixed, mobile/relocatable, air, and space targets to assure the preeminence of U.S. Aerospace Forces.

**Assessment**

- Computational weapons physics
- Lethality/vulnerability technology and methodology development
- Weapon simulation and analysis

**Explosives**

- Explosive characterization
- Explosive processing/demilitarization
- High energy explosives

**Weapon Integration**

- Weapon aerodynamics
- Weapon structure
- Launcher aircraft interface
- Launcher aircraft weapon integration
- Subsystem integration

**Fuses**

- Advanced initiation
- Fuse modeling and simulation
- Proximity fusing

**Guidance, Navigation, and Control**

- Advanced munitions control
- Anti-jam GPS
- Guidance and control laws
- Integrated guidance
- Miniature sensors
- Multi-stage guidance
- Tactical inertial navigational system

**Processor/Algorithms**

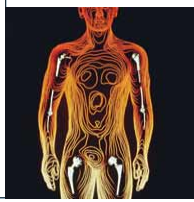
- Munitions algorithms
- Munitions processors

**Seekers**

- Conformal electronic safety and arming
- Hardware in the loop
- LADAR
- Millimeter wave
- Multimode seekers
- Passive IR
- Synthetic aperture seekers
- Synthetic scene generators

**Warhead**

- Agent defeat
- Enhanced lethal mechanisms
- Ordnance integration
- Warhead design and experimentation
- Warhead materials characterization



**Human Effectiveness Directorate**  
Wright-Patterson AFB, OH  
[www.he.afrl.af.mil](http://www.he.afrl.af.mil)

The Human Effectiveness Directorate is responsible for human-centered science and technology.

### Human Effectiveness Directorate

#### Core Technology Areas

Crew Systems Interface

- Information Display and Decision Support
- Crew System Design Technologies

Warfighter Training Systems

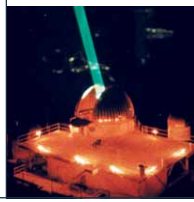
- Warfighter Skill Development and Training
- Warfighter Training Simulation

Bioeffects and Protection

- Directed Energy Bioeffects
- Crew Protection

Deployment and Sustainment

- Toxic Hazard Effects
- Logistician Effectiveness



**Directed Energy Directorate**  
Kirtland AFB, NM  
[www.de.afrl.af.mil](http://www.de.afrl.af.mil)

The mission of the Directed Energy Directorate is to develop, integrate and transition science and technology for Directed Energy to include high-power microwaves, lasers, adaptive optics, imaging and effects to assure the preeminence of U.S. in air and space.

#### Advanced Optics and Imaging Division

Develops techniques and technologies to improve optical systems then transition those technologies to warfighter commands, such as the USAF Airborne Laser.

#### High-Power Microwave Division

- USAF center of excellence for high-power microwave technologies, including hardware, systems, and hardening.

#### Laser Division

- Develops lasers including semiconductor, gas, chemical and solid state technologies and transitions them to the warfighter.

#### Starfire Optical Range Division

- Operates 3 large telescopes, multiple lasers and adaptive optics systems in conducting research and development of technology to control high-energy ground-based laser beams and high-resolution imaging.

#### Technology Assessment Division

- Assesses applications and effects of directed energy technology systems.



**Space Vehicles Directorate**  
Kirtland AFB, NM  
[www.vs.afrl.af.mil](http://www.vs.afrl.af.mil)

The mission of the Space Vehicles Directorate is to innovate, develop, integrate and transition science and technology for effective and affordable space vehicles, launch vehicles and space concepts supporting America's Aerospace Force.

AFRL/VS is organized into three divisions with the following responsibilities:

#### Battlespace Environment Division

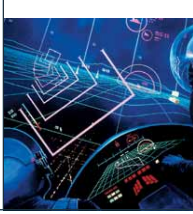
Detect and understand aerospace environment natural threats to warfighting systems and provide active and passive means to eliminate/mitigate such threats.

#### Space Technology Integration and Demonstration Division

Develop, integrate, and demonstrate emerging military space concepts and vehicle technologies – otherwise unavailable or not mature enough from commercial/civil sources – in support of the Warfighter.

#### Surveillance and Control Division

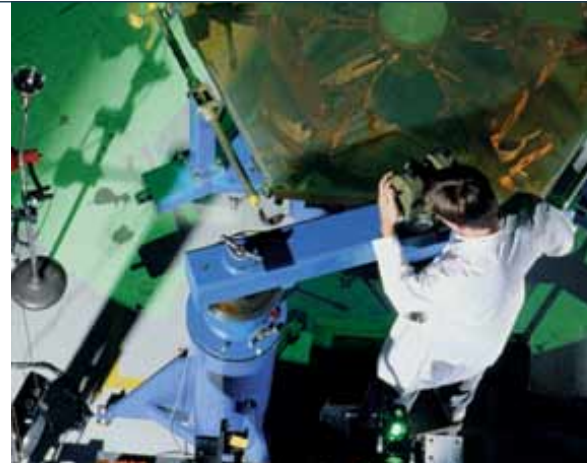
Develop military focus technologies for space based surveillance of space, air, and ground, and spacecraft survivability from natural and manmade threats.



**Information Directorate**  
**Rome, NY**  
[www.rl.af.mil](http://www.rl.af.mil)

The mission of the Information Directorate is the advancement and application of information systems science and technology for Information Dominance and its transition to air, space, and ground systems to meet customer needs.

- Dynamic planning and execution
- JFACC battle management
- Air operations planning
- Force level execution system
- CEE sensor-to-user demonstration
- Collaborative planning environments
- Collaborative engineering environment
- Modeling and distributed simulation
- Knowledge-based technology for integrated joint force campaign management
- Evolutionary design of complex software
- Intelligent information systems technology
- Intelligent agent technology
- Embedded software technology
- Embedded high performance computing
- Adaptive/reconfigurable/scalable information systems
- Optimal information system design/development
- Real-time signal processor enhancement
- Micro-electromechanical systems for C4I applications
- Global information exchange
- Network protocol
- Network management and control
- Distributed information infrastructure
- Distributed environments
- Multilevel security
- Intrusion/malicious code detection
- Information attack mitigation
- COMSEC
- Multi-band/multi-mode radios
- LPI/AJ waveforms
- Uninhabited air vehicles
- Satellite communications
- Airborne communications
- Global awareness
- SIGINT exploitation
- Information fusion
- Mass storage and retrieval
- Speech/audio processing
- Information data handling
- Image/video exploitation
- Targeting technology



# Development and Test Centers

**Arnold Engineering Development Center (AEDC)**  
Arnold AFS, TN  
[www.arnold.af.mil](http://www.arnold.af.mil)

AEDC is the world's largest flight simulation facility.

## **Aircraft Aerodynamics**

- Flight simulation using large scale aerodynamic models
- Engine inlet compatibility testing
- Store separation testing

## **Turbine Propulsion**

- Component improvement
- Engine development
- Engine performance
- Freejet testing
- Icing

## **Hypersonics**

- Characterization of vehicle stability
- Jet control effects
- Seeker-window aerothermal environments
- Impact of hypervelocity particles upon structures
- Re-entry vehicle erosion/ablation studies
- Material testing of re-entry vehicle heatshields and windows

## **Solid/Liquid Rockets**

- Strategic systems
- Theater and tactical missile defense
- Space propulsion systems
- Aging surveillance

## **Space**

- Focal plane characterization
- Solar simulation

- Separation dynamics
- Zero-g
- Small space thrusters
- Electromagnetic susceptibility
- Contamination and BRDF measurements
- X-ray effects

## **Test Technology**

- Facility performance and design
- Test techniques
- Instrumentation and diagnostics
- Computation and modeling
- Instrumentation and diagnostics



AFFTC conducts Development Test and Evaluation (DT&E) on manned and unmanned aerospace systems. AFFTC also conducts flight evaluation and recovery of research vehicles and DT&E of aerodynamic decelerators.

### Propulsion

- Engine performance
- Calculate and standardize thrust
- Engine airframe interference
- Airstart capability

### Performance

- Takeoff
- Climb
- Cruise
- Maneuvering
- Descent
- Landing

### Flying Qualities

- Stability and control characteristics
- Handling qualities characteristics
- Longitude and lateral directional maneuvers
- Stability derivative determination
- Frequency response analysis
- Flight control systems

### Fuel Systems

### Environmental Control Systems

### Aircraft Arresting Systems

### Landing Gear and Brakes

### Aircraft Electrical and Pneudraulic

### Human Factors

- Man-machine interactions
- Manned aerospace vehicles
- Systems integration
- System safety

### Unmanned Aerospace Vehicles

- Performance analysis
- Subsystem performance

### Reliability and Maintainability

### Flight Control

- Mechanical characteristics
- Electronic characteristics
- Control systems authority
- Man/machine compatibility
- Aircraft/flight control effectiveness

### Structural Dynamics and Flutter

- Structural test
- Aircraft flight loads
- Real-time flight flutter analysis

### Avionics Integration

- Navigation
- Radar
- Electro-optics
- Threat warning
- ECM/ECCMS
- System integration
- Reconnaissance/photo

### Electronic Warfare

- Electronic attack
- Electronic protection
- Electronic support
- Air-to-air and air-to-ground radar
- Communications, navigation and identification
- Modeling and simulation
- Integration facility for avionics system testing
- Benefield anechoic facility
- AF electronic warfare evaluation simulator
- Open-air ranges
- Weapon Delivery

- Bombing
- Air-to-air and air-to-ground multi-mode missiles
- Stores management systems

### Aircraft Aerial Delivery/Parachute

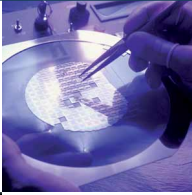
- Personnel parachutes
- Cargo extractions

### All Weather/Climatic

- Arctic
- Tropical
- Hot desert
- Wet runway
- Engine water injection
- In-flight icing

### Test Ranges and Facilities

- Missiles/weapons support
- Flutter and vibration facility
- Air-to-air weapons scoring
- Radar fidelity and geometric ranges
- Photo and IR resolution
- Engine and propulsion facilities
- In-flight icing
- Weight and balance
- Aerial refueling
- Simulation
- Telemetry
- Real-time mission control
- Data acquisition
- Reduction and processing
- Photographic
- Instrumentation design
- Installation and operation
- Time-space-position-information (GPS, radar, cinetheodolites)
- Large anechoic facilities



**Air Armament Center (AAC)**  
Eglin AFB, FL  
[www.eglin.af.mil](http://www.eglin.af.mil)

AAC (formerly AFDTC) is responsible for development, acquisition, testing, deployment, and sustainment of all air-delivered weapons. The 46th Test Wing (one component of AAC) is responsible for test and evaluation of Air Force munitions/air armament, and command and control (C2) systems.

**Digital Modeling, Simulation, and Analysis**

- Real-time data collection, reduction and analysis
- 3-D data visualization

**Multi-Spectral Signature Measurement**

- Radar (including millimeter wave)
- Infrared
- Electro-optical
- Laser

**Hardware-In-The-Loop Simulation**

- Multi-spectral sensor performance evaluation
- Electronics performance evaluation
- GPS simulation

**Installed Systems Test and Evaluation**

- Electromagnetic compatibility/interference
- World-wide weather climatic replication (250' x 200' x 70' chamber)

**Open Air Test and Evaluation Instrumentation**

- Multi-spectral imaging
- GPS tracking
- Laser, electro-optical, and radar tracking
- Telemetry
- High speed photography
- Target vulnerability
- Warhead lethality





**46th Test Group (Part of AAC)**  
**Holloman AFB, NM**  
**[www.46tg.af.mil](http://www.46tg.af.mil)**

The 46th Test Group is part of the Air Armament Center (AAC). The group is involved in several types of Test and Evaluation support operations.

**Guidance and Navigation  
Test Operations**

- Time Space Position Information (TSP) reference systems
- Global Positioning System (GPS) accuracy and vulnerability testing
- GPS/inertial navigation system integration testing
- Centrifuge testing
- Multi-axis test tables

**Sled Track Test Operations**

- Environmental testing (high G, aerothermal, rain/ice/particle)
- Munition dispenser testing
- Munition lethality/impact testing
- Human factors response to ejection from aircraft
- Ejection seat capsule and parachute performance testing
- Missile warning receivers performance testing
- Infrared countermeasures performance testing

**Radar Cross Section (RCS)  
Measurement Operations**

- Monostatic and bistatic radar signature testing
- Glint, imaging, near field, and antenna pattern measurements
- Most accurate DoD Low Observable (LO) outdoor range
- Phase coherent radar

**Flight Test Operations**

- Avionics equipment testing
- GPS, precision data recording, and telemetry
- Electronic countermeasures
- Chaff/flares testing
- Air combat maneuvering instrumentation (AFMI) pods
- Multiple format photographic coverage, including helmet-mounted video cameras
- Aircraft chase support

# Air Logistics Centers (ALCs)

The Air Force operates five Air Logistics Centers providing engineering, manufacturing, maintenance, repair, and support services to the Air Force operational commands.

**OO-ALC, Hill AFB**  
**Ogden, UT**  
[www.hill.af.mil](http://www.hill.af.mil)

**WR-ALC, Robins AFB**  
**Warner-Robins, GA**  
[www.robins.af.mil](http://www.robins.af.mil)

**OC-ALC, Tinker AFB**  
**Oklahoma City, OK**  
[www.tinker.af.mil](http://www.tinker.af.mil)

## Chemistry/Chemical Engineering

Primary Centers: (OC-ALC, OO-ALC, WR-ALC)

- Plating
- Coatings
- Corrosion quantification
- Corrosion prevention
- Environmentally safe cleaners and paint removers
- Hazardous chemical disposal and replacement (chromium and halon)
- Microbiology
- Fuels
- Lubricants
- Deicers
- Chemical processing
- Chemical process engineering
- Electrophoretics
- Plasma spraying
- Ion vapor deposition

## Computer Science/Operations Research

Primary Centers: (OC-ALC, OO-ALC)

- Information technologies
- Software engineering
- Neural networks
- Expert systems
- Genetic algorithms
- Automated information systems
- Integrated sensor analysis
- System modeling and simulation
- Diagnostic software
- Database management systems
- Computer aided design and manufacturing
- Artificial intelligence

## Electrical/Electronic Engineering

Primary Centers: (OC-ALC, OO-ALC)

- Circuit analysis and fault diagnosis
- Electronic reliability
- Connectors and corrosion
- Maintenance-free power systems
- Diagnostic sensors
- Electronic materials
- Circuit repair
- Laser assisted deposition and repair
- IR detectors
- Integrated neural network hardware

## Environmental Engineering

Primary Centers: (OC-ALC, OO-ALC, WR-ALC)

- Groundwater contamination
- Hazardous waste site-characterization
- Remediation and treatment
- Environmental sensors
- Replacement materials

## Management Science

Primary Centers: (OC-ALC, OO-ALC)

- Complex system modeling and dynamics
- Management and business process engineering/reengineering
- Stock controls
- Just-in-time inventories
- Lean logistics



### Manufacturing

Primary Centers: (OC-ALC, OO-ALC, WR-ALC)

- Process engineering/reengineering
- Computer aided design and manufacturing
- Concurrent process design
- Lean manufacturing
- Sterolithography
- Electric discharge machining

### Mathematics/Statistics

Primary Centers: (OC-ALC, OO-ALC)

- Process optimization
- Scheduling
- Routing
- Information compression and processing
- Diagnostic imaging
- System modeling and simulation
- Life-prediction methodologies
- Information technologies
- Software engineering
- Process control
- Tomographic reconstruction

### Mechanical/Structural Engineering

Primary Centers: (OC-ALC, OO-ALC, WR-ALC)

#### Mechanics of Materials

- Fracture mechanics
- Corrosion induced fatigue
- Non-destructive inspection techniques (ultrasonics, x-rays, laser holography, N-ray, penetrants)
- Life-prediction
- Multi-site damage
- Friction and wear mechanisms
- Composite materials and repair
- Diffusion heating process

#### Structural Engineering

- Condition based maintenance
- Diagnostic sensors
- Vibration and fatigue analysis
- Bearing fault detection
- Expert diagnostic system
- Imbedded diagnostics and prognostics
- Smart structures
- Dynamic thermal loading
- Precision measurement systems

#### Fluidics

- Hydraulic systems
- Fluidic paint removal systems
- Water jet cleaning
- Abrasive flows

#### Metallurgical Processes

- Thermal processing
- Welding
- Bonding
- Brazing
- Heat treating
- Blasting

### Occupational/Environmental Health

Primary Centers: (OC-ALC, OO-ALC, SA-ALC, SM-ALC)

- Diagnostic training algorithms
- Automated training aids

### Optics/Electro-Optics

Primary Centers: (OC-ALC, OO-ALC, WR-ALC)

- IR detectors
- Optical memories
- Optical information processing

### Physics/Solid State

Primary Centers: (OC-ALC, OO-ALC)

- Laser-based diagnostic and measurement systems
- X-ray tomography
- Laser enhanced deposition and machining techniques

# SBIR Resources



## Small Business Administration (SBA)

### General SBA Information

U.S. Small Business Administration  
409 Third Street SW  
Washington, DC 20416  
SBA Answer Desk: (800) 8-ASK-SBA  
SBA Answer Desk Fax: (202) 205-7064  
TDD for the Hearing Impaired:  
(704) 344-6640

SBA Office of Technology (SBIR):  
T: (202) 205-6450

SBIR Pre-Solicitation Announcement  
[www.sba.gov/SBIR/presol.html](http://www.sba.gov/SBIR/presol.html)

Every quarter, the SBA Office of Technology posts an updated schedule of RFP release dates for the SBIR/STTR programs and due dates for proposals. This Pre-Solicitation Announcement is available only electronically. Dates are subject to change by the participating federal agencies. For details on the solicitations, contact the individual agencies listed.

### SBA On-line Resources

SBA On-line:  
[www.sbaonline.sba.gov](http://www.sbaonline.sba.gov)  
T: (800) 697-4636

U.S. Business Advisor:  
[www.business.gov](http://www.business.gov)

SBIR Information  
[www.sba.gov/sbir/](http://www.sba.gov/sbir/)

ACE-Net:  
<http://ace-net.unh.edu/>

### SBA Office of Women's Business Ownership (OWBO)

[www.sbaonline.sba.gov/womeninbusiness](http://www.sbaonline.sba.gov/womeninbusiness)

Other contacts:  
[www.sbaonline.sba.gov/hotlist/women.html](http://www.sbaonline.sba.gov/hotlist/women.html)

T: (202) 205-6673  
F: (202) 205-7287

OWBO has many publications and programs to help women-owned businesses. Information about its programs can be found at OWBO's Web page or by calling OWBO or the SBA Answer Desk. SBA's hotlist for women in business, shown at the second Web address above, has connections to other women's organizations active in science and technology.

## Department of Defense (DoD)

### DoD SBIR Program

OSD/SADBU  
U.S. Department of Defense  
3061 Defense Pentagon - Room 2A338  
Washington, DC 20301-3061

T: (800) 382-4634  
F: (800) 462-4128

[www.acq.osd.mil/sadbu/sbir/](http://www.acq.osd.mil/sadbu/sbir/)

SBIR Solicitation Mailing List:  
e-mail: [sbir@DTIC.dla.mil](mailto:sbir@DTIC.dla.mil)

SBIR Help Desk e-mail:  
[SBIRHELP@us.teltech.com](mailto:SBIRHELP@us.teltech.com)

### U.S. Air Force SBIR Program

SBIR Program Manager  
AFRL/XPTT  
1864 4th Street, Suite 1, Bldg. 15  
Wright-Patterson AFB, OH 45433

T: (800) 222-0336  
F: (937) 255-2329

[www.afrl.af.mil/sbir/index.htm](http://www.afrl.af.mil/sbir/index.htm)



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*Science and Technology for Tomorrow's Aerospace Force*